

AMENDMENT

Serial Number: 08/902809

Filing Date: July 30, 1997

Title: SELECTIVE SPACER TO PREVENT METAL OXIDE FORMATION DURING POLYCIDAL REOXIDATION

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IN THE CLAIMS

1-22. (Previously Canceled)

23. (Previously Amended) A semiconductor device comprising:

an oxide layer;

at least one feature over the oxide layer, the feature having a surface and being contiguous with the oxide layer at a boundary; and

a spacer comprising silicon nitride or an amorphous silicon film covering the surface of the feature and terminating at the boundary wherein the spacer is not in contact with the oxide layer.

24. (Previously Amended) The semiconductor device of claim 23 wherein:

the feature comprises an electrode including polysilicon, a refractory metal, and a dielectric, or undoped silicon;

and

the surface of the feature comprises sidewalls of the electrode.

25. (Previously Amended) The semiconductor device of claim 23, further comprising a layer of reoxidation on the spacer and the oxide layer, the layer of reoxidation being formed by a polycide reoxidation and forming a smile effect at the boundary between the feature and the oxide layer.

26. (Previously Amended) An electronic device comprising:

a first layer of oxide;

a feature over the first layer of oxide, the feature having a surface;

a boundary between the first layer of oxide and the feature; and

a spacer comprising silicon nitride or an amorphous silicon film only on the surface of the feature.

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27. (Previously Added) The electronic device of claim ~~26~~ wherein the spacer is deposited on the surface of the feature extending to and terminating at the boundary.

28. (Previously Amended) The electronic device of claim 26 wherein:
the first layer of oxide comprises a layer of gate oxide;
the feature comprises an electrode including polysilicon, a refractory metal, and a dielectric, or undoped silicon;
and
the surface of the feature comprises sidewalls of the electrode.

29. (Previously Amended) The electronic device of claim 26, further comprising a second layer of oxide on the spacer and the first layer of oxide, the second layer of oxide forming a smile effect at the boundary between the feature and the first layer of oxide.

30. (Previously Amended) An electronic device comprising:
a first layer of oxide;
a feature over the first layer of oxide, the feature having a surface;
a boundary between the first layer of oxide and the feature;
a spacer comprising silicon nitride or an amorphous silicon film only on the surface of the feature; and

a second layer of oxide on the spacer and the first layer of oxide, the second layer of oxide forming a smile effect at the boundary between the feature and the first layer of oxide.

31. (Previously Amended) The electronic device of claim 30 wherein:
the first layer of oxide comprises a layer of gate oxide;
the feature comprises an electrode including polysilicon, a refractory metal, and a dielectric, or undoped silicon;
the spacer is deposited on the surface of the feature extending to and terminating at the boundary; and
the surface of the feature comprises sidewalls of the electrode.

32-35. (Previously Canceled)

36. (Previously Amended) An electronic device comprising:

a first layer of oxide;

an electrode on the first layer of oxide, the electrode having sidewalls; and

a spacer comprising silicon nitride or an amorphous silicon film deposited only on the sidewalls of the electrode, the spacer extending to and terminating at a boundary between the first layer of oxide and the sidewalls of the electrode.

37. (Previously Amended) The electronic device of claim 36 wherein:

the first layer of oxide comprises a layer of gate oxide; and

21 the electrode comprises polysilicon, a refractory metal, and a dielectric, or undoped silicon

38. (Previously Amended) The electronic device of claim 36, further comprising a second layer of oxide on the spacer and the first layer of oxide, the second layer of oxide forming a smile effect at the boundary between the first layer of oxide and the sidewalls of the electrode.

39. (Previously Amended) A semiconductor device, comprising:

a first layer of oxide;

a feature protruding from the first layer of oxide and having sidewalls, the feature including:

a polysilicon portion;

a portion of conductive material deposited on the polysilicon portion; and

a spacer comprising silicon nitride or an amorphous silicon film selectively deposited only on the sidewalls of the feature; and

a second layer of oxide deposited on the semiconductor device, wherein the spacer is interposed between the second layer of oxide and the sidewalls of the feature.

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40. (Previously Amended) The semiconductor device of claim 39, wherein the portion of conductive material comprises tungsten silicide.

41. (Previously Added) A semiconductor device, comprising:

a first layer of oxide;

a feature protruding from the first layer of oxide and having sidewalls, the feature comprising:

a layer of polysilicon;

one or more layers of conductive materials deposited on the layer of polysilicon, wherein at least one of the layers comprises tungsten silicide; and

a silicon nitride spacer selectively deposited only on the sidewalls of the feature;

and

a second layer of oxide deposited on the semiconductor device, wherein the silicon nitride spacer is interposed between the second layer of oxide and the sidewalls of the feature.

42. (Previously Amended) A gate electrode, comprising:

one or more layers of conductive materials etched to form a feature having sidewalls exposing the layers;

a selectively deposited spacer comprising silicon nitride or an amorphous silicon film, wherein the spacer is deposited only on the sidewalls of the feature;

a layer of oxide disposed over the gate electrode.

43. (Previously Amended) The gate electrode of claim 42, wherein the layers of conductive materials comprise tungsten silicide.

44. (Previously Added) An electronic device comprising:

a first layer of oxide;

an electrode on the first layer of oxide, the electrode having sidewalls; and

spacer means for protecting the electrode from a reoxidation, the spacer means comprising silicon nitride or an amorphous silicon film and being deposited on the sidewalls of

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the electrode and not on the first layer of oxide.

45. (New) The semiconductor device of claim 41 wherein the feature further comprises a dielectric on the one or more layers of conductive materials.

46. (New) The semiconductor device of claim 41 wherein the second layer of oxide comprises a smile effect at a boundary between the feature and the first layer of oxide.

47. (New) A semiconductor device comprising:

an oxide layer;

an electrode over the oxide layer, the electrode including polysilicon, a refractory metal, and a dielectric, the electrode having sidewalls and being contiguous with the oxide layer at a boundary; and

21 a spacer comprising silicon nitride or an amorphous silicon film covering the sidewalls of the electrode and terminating at the boundary wherein the spacer is not in contact with the oxide layer.

48. (New) The semiconductor device of claim 47, further comprising a layer of reoxidation on the spacer and the oxide layer, the layer of reoxidation being formed by a polycide reoxidation and comprising a smile effect at the boundary between the electrode and the oxide layer.

49. (New) A semiconductor device comprising:

an oxide layer;

an electrode over the oxide layer, the electrode comprising undoped silicon, the electrode having sidewalls and being contiguous with the oxide layer at a boundary; and

a spacer comprising silicon nitride or an amorphous silicon film covering the sidewalls of the electrode and terminating at the boundary wherein the spacer is not in contact with the oxide layer.

50. (New) The semiconductor device of claim 49, further comprising a layer of reoxidation on the spacer and the oxide layer, the layer of reoxidation being formed by a polycide reoxidation and comprising a smile effect at the boundary between the electrode and the oxide layer.

51. (New) An electronic device comprising:
a first layer of oxide;
an electrode including polysilicon, a refractory metal, and a dielectric over the first layer of oxide, the electrode having sidewalls;
a boundary between the first layer of oxide and the electrode; and
a spacer comprising silicon nitride or an amorphous silicon film only on the sidewalls of the electrode.

52. (New) The electronic device of claim 51 wherein the spacer is deposited on the sidewalls of the electrode extending to and terminating at the boundary.

53. (New) The electronic device of claim 51 wherein the first layer of oxide comprises a layer of gate oxide.

54. (New) The electronic device of claim 51, further comprising a second layer of oxide on the spacer and the first layer of oxide, the second layer of oxide comprising a smile effect at the boundary between the electrode and the first layer of oxide.

55. (New) An electronic device comprising:
a first layer of oxide;
an electrode comprising undoped silicon over the first layer of oxide, the electrode having sidewalls;
a boundary between the first layer of oxide and the electrode; and
a spacer comprising silicon nitride or an amorphous silicon film only on the sidewalls of the electrode.

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56. (New) The electronic device of claim 55 wherein the spacer is deposited on the sidewalls of the electrode extending to and terminating at the boundary.

57. (New) The electronic device of claim 55 wherein the first layer of oxide comprises a layer of gate oxide.

58. (New) The electronic device of claim 55, further comprising a second layer of oxide on the spacer and the first layer of oxide, the second layer of oxide comprising a smile effect at the boundary between the electrode and the first layer of oxide.

59. (New) An electronic device comprising:
a first layer of oxide;
an electrode including polysilicon, a refractory metal, and a dielectric over the first layer of oxide, the electrode having sidewalls;
a boundary between the first layer of oxide and the electrode;
a spacer comprising silicon nitride or an amorphous silicon film only on the sidewalls of the electrode; and
a second layer of oxide on the spacer and the first layer of oxide, the second layer of oxide comprising a smile effect at the boundary between the electrode and the first layer of oxide.

60. (New) The electronic device of claim 59 wherein:
the first layer of oxide comprises a layer of gate oxide; and
the spacer is deposited on the sidewalls of the electrode extending to and terminating at the boundary.

61. (New) An electronic device comprising:
a first layer of oxide;
an electrode comprising undoped silicon over the first layer of oxide, the electrode having sidewalls;
a boundary between the first layer of oxide and the electrode;

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a spacer comprising silicon nitride or an amorphous silicon film only on the sidewalls of the electrode; and

a second layer of oxide on the spacer and the first layer of oxide, the second layer of oxide comprising a smile effect at the boundary between the electrode and the first layer of oxide.

62. (New) The electronic device of claim 61 wherein:

the first layer of oxide comprises a layer of gate oxide; and

the spacer is deposited on the sidewalls of the electrode extending to and terminating at the boundary.

63. (New) The semiconductor device of claim 39 wherein the feature further comprises a dielectric on the portion of conductive material.

64. (New) The semiconductor device of claim 39 wherein the second layer of oxide comprises a smile effect at a boundary between the feature and the first layer of oxide.

65. (New) The gate electrode of claim 42 wherein the feature includes polysilicon, a refractory metal, and a dielectric, or undoped silicon.
